SYSTRON DONNER

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SECTION I - DESCRIPTION

1.1 INTRODUCTION

The Silicon Quarter Rack Series power supply is a flexible and dependable source of D.C. power, which can be used to meet a variety of needs. These needs may range in scope from inspection and production testing, to laboratory bench testing and systems applications.

The wide range of outputs available makes this unit well suited for use as a basic laboratory power source. The ability to provide power packaged in minimum space with high reliability meets the demands of most systems requirements.

All components used in the construction of the Silicon Quarter Rack units are of the highest quality available, and have been subjected to 100% incoming inspection.

Each electrolytic filter capacitor is of computer grade, and has been quoted by the manufacturer as having a life expectancy exceeding ten (10) years. All silicon transistors have been "derated" and temperature aged to provide high reliability. All rectifiers are hermetically sealed silicon units, and all Zener diodes have been temperature stabilized.

1.2 GENERAL FEATURES

Output, Sensing and Remote Programming terminals are located on a terminal board mounted on the rear panel of the unit. The AC power switch, AC pilot lamp, current mode indicator lamp, current and voltage controls and appropriate metering devices are all located on the front panel. For convenience, additional output terminals have been provided on the front panel.

1.2.1 Constant Voltage Mode

A constant voltage is maintained across the output terminals at any preset value from zero to rated voltage output, provided that the load does not draw more than either the rated output current or more than the preset limiting current value determined by the front panel current control settings.

1.2.2 Constant Current Mode

Constant current operation is achieved by maintaining a constant voltage across an internal current sensing resistor. An automatic cross over network changes the mode of operation from Constant Voltage to Constant Current when the current demand reaches that of the preset current adjust control. The point at which the operating mode automatically changes is a function of variations in load conditions. The cross over point is adjustable, and can be established anywhere within the current and voltage range of the unit.

1.2.3 Automatic Current Limiting

Short circuit protection is provided by the Automatic Current Limiting circuit which limits the maximum output current under all load conditions. The point at which automatic current limiting occurs is variable, and may be selected anywhere between 5% of the rated current output and maximum rated current output of the unit. In the event of a short circuit, the output voltage will drop to zero, and will return to its previous level only upon removal of the short circuit.

1.2.4 Automatic Overvoltage Protection (Optional Feature)

Automatic Overvoltage (OV) protection is available as an option wherein special circuitry automatically tracks the programmed output voltage and prevents it from exceeding this output voltage. The voltage differential that will cause the OV to trip is approximately 10% or 1.5 volts above the programmed

1.2.4 Automatic Overvoltage Protection (Optional Feature)(Cont'd)

voltage. An internal sensitivity control is provided to desensitize the overvoltage protection circuit.

1.2.5 Remote Programming

Remote Programming is provided in the voltage mode of operation, and may be utilized over the entire voltage range of the unit. The scale factor for Remote Voltage Programming is 100 ohms per volt.

1.3 PRECAUTIONARY MEASURES

1.3.1 Wire Size

To assure proper regulation under all load conditions, and to prevent severe distortions of the AC line voltage, it is very important to take into consideration the physical size and current handling capabilities of the input power line. Serious losses in regulation and an increase in ripple may result from underrated or overloaded AC input lines. The maximum AC impedance from the breaker box to the power supply input should not exceed 0.75 ohms.

1.3.2 Voltage Regulator and Inverter Inputs

Do not use voltage regulators or inverters as a primary power source. The outputs of these devices are usually not sinusoidal in nature, and if used as the AC source for the power supply, will cause serious loss of regulation of the power supply output. Capacitive input filtering used for semiconductor power supplies requires charging to the peak of the rectified AC wave which non-sinusoidal AC sources cannot provide.

1.3.3 Variable Transformer Input

If a variable transformer is to be used to test the power supply for low and high AC line operation, it must be able to

1.3.3 Variable Transformer Input (Cont'd)

supply at least twice the VA requirements of the power supply and load.

1.3.4 Systems Considerations

In systems applications it is recommended that each power supply input power line be run separately to the AC distribution box, in order to minimize cross coupling and interaction between equipment. Do not run sensitive signal leads such as the remote sensing leads in the same cable as the AC input without shielding. It is strongly recommended that the AC input cables should not be run in close proximity to the output load cable leads, if minimum ripple is desired.

1.3.5 Terminal Post Resistance

All terminals and shorting links serving Outputs, Sensing and Programming must be securely tightened before use. Serious loss of regulation and an increase in ripple can result due to a voltage drop caused by loose terminals and shorting links.

1.4 SPECIFICATIONS

Electrical and physical specifications appear on the following Trygon Specification Sheet.

SECTION II - INSTALLATION AND OPERATION

2.1 MECHANICAL INSTALLATION

2.1.1 General

If the Silicon Quarter Rack Series power supply is to be used in a portable bench type configuration, no special mechanical installation is required. However, if the unit is to be rack mounted, special rack mounting adapters must be used to secure the unit to the relay racks. Triple mount (RMM-3) and quadruple mount (RMM-4) rack panel adapters are available.

2.1.2 Rack Panel Adapter Mounting

1) Remove the 6-32 screws which fasten the cover to the power supply chassis.

2) Remove and rotate the cover so that the front is now facing to the rear.

3) Fasten the cover securely in position with the 6-32 screws previously removed.

4) Attach the handles to the Rack Panel Adapter.

5) Stand the Rack Panel Adapter in front of the power supply. In order to mount the power supply properly, the top of the Rack Panel Adapter must face up. The top is distinguishable from the bottom in that all the holes, including those for the handles, are in a straight row across the front of the Rack Panel Adapter.

6) Attach the power supply to the Rack Panel Adapter with the 6-32 screws and lock washers provided.

2.2 ELECTRICAL CONNECTIONS

2.2.1 Input, Power:

A heavy duty 3 wire line cord and molded plug with grounding prong provides a path for input power to the unit.

The power handling ability of the AC power lines feeding AC power to the line cord must be considered, as serious losses in regulation and substantial increases in ripple can occur as a result of insufficient power handling capacity of these lines. The AC impedance from the breaker box to the power supply input connector should not exceed 0.75 ohms. All AC power line connections must be securely tightened, and any movable electric contact surface (such as the wiper arm of a variable transformer) should be kept clear of impedance producing oxide coatings.

Care should be exercised in selecting the proper wire size for the AC input lines. The figures listed in Table 2-1 will serve as a guide in making this selection.

TABLE 2-1 - AC INPUT WIRE SIZE

Length of Run (Single Lead)	Wire Size (AWG Standards)
10 feet or less	12
10 feet to 20 feet	10
20 feet to 50 feet	8
50 feet to 100 feet	6

2.2.2 Output, Rear Panel

An eleven terminal barrier strip mounted on the rear panel provides output, sensing, programming and ground connections. Table 2-2 SHORTING LINK APPLICATION, REAR PANEL, lists the various shorting link connections required for any of the various modes of operation.

2.2.3 Output, Front Panel

Three binding post terminals mounted on the front panel provide output (+V and -V) and ground (G) connections.

2.2.4 Front or Rear Panel Output Selection

Output voltage is available from either the front or rear panel terminals. However, while regulation is maintained at both terminals, the rated regulation is available from the rear terminal only.

2.2.5 Shorting Link Application, Rear Panel

The power supply is shipped from the factory with shorting links in place across terminals 1 and 2, 4 and 5, and 6 and 7 of the rear panel barrier strip. In this configuration, and with the load connected across the rear panel output terminals, local sensing and programming operation from the rear panel is provided. Connections for other configurations are shown in Table 2-2 SHORTING LINK APPLICATION, REAR PANEL.

TABLE 2-2 SHORTING LINK APPLICATION, REAR PANEL

Selection	Function	Connections Required
1	Local Sensing	1 and 2; 6 and 7
	Local Programming	4 and 5
2	Local Sensing	1 and 2; 6 and 7
	Remote Programming	3 and 4; PGM resistor across 4 and 5
3	Remote Sensing	1 and 2 connected at load (-)
		6 and 7 connected at load (+)
	Local Programming	4 and 5
4	Remote Sensing	1 and 2 connected at load (-)
		6 and 7 connected at load (+)
	Remote Programming	3 and 4; PGM resistor across 4 and 5

NOTE: If terminals 1 and 2 or 6 and 7 are left open, the output will become unregulated.

2.3 CONTROLS

2.3.1 Front Panel

TABLE 2-3 - FRONT PANEL CONTROLS

SYMBOL	NAME	FUNCTION
S1	AC POWER	Toggle switch, controls input power.
R29	VOLTAGE ADJUST (Coarse)	Potentiometer, adjusts voltage output.
R30	VOLTAGE ADJUST (Vernier)	Potentiometer, adjusts voltage output.
R39	CURRENT ADJUST (Coarse)	Potentiometer, adjusts current.

2.3.2 Internal

All internal control settings have been factory preset, and require no additional adjusting. However, if it should become necessary to adjust any of the internal controls due to circuit changes caused by component aging or replacement, refer to the calibration section of this instruction manual.

2.4 OPERATION

2.4.1 Control Settings

Set all front panel controls fully CW so that unit will operate in the Voltage rather than Current Limiting mode.

2.4.2 Shorting Links

If Local Sensing rather than Remote Sensing operation is desired, ascertain that shorting links are in place across the appropriate terminals.

2.4.3 Grounding

Either side of the Output may be grounded, or the Output may be used in a floating condition.

2.4.4 Power On

Connect the line cord to a nominal AC input power source. Set POWER switch S1 to AC-ON, and observe that pilot lamp DS1 glows.

2.4.5 Warm-Up

No warm-up time is necessary to place the unit into operation. However, a 30 minute warm-up period is recommended to reach rated stability.

2.4.6 Series Operation

To operate two or more power supplies in a series configuration, connect the output of each power supply in series. When operating in this mode, it is necessary to adjust the output of each unit independently. The output voltage is equal to the sum of the voltage settings of each power supply.

2.4.7 Parallel Operation

Two power supplies may be connected in parallel when a greater current than obtainable from a single power supply is required. The supplies that are to be connected in parallel need not have equal ratings nor be from identical Trygon series. One of the two supplies should be set to a slightly higher output voltage than that required, and their respective plus and minus terminals connected together as shown in Figure 2-1.

2.4.7 Parallel Operation (Cont'd)

To achieve remote sensing, in parallel connected supplies, connect the sensing leads of the lower voltage supply to the load.

The following are some precautions which must be noted in parallel operation:

(A) The inherent load regulation of the parallel connected supplies is equal to the nominal regulation of the individual supply plus the difference between the nominal voltage setting of the two supplies.

(B) When parallel-connected supplies are used in a systems application, it is advisable to turn on both units simultaneously. The inputs of both supplies should be connected to a single circuit breaker.

(C) When two supplies are operating in parallel, it is not advisable to set either voltage control near zero since this would cause severe damage to the control.

(D) If parallel operation of Trygon power supplies utilizing overvoltage (OV) protection is desired, the following steps should be followed:

1. Disconnect the gate lead from the OV SCR in one of the power supplies.
2. Initially, set the supply with the OV connected to a slightly higher voltage.

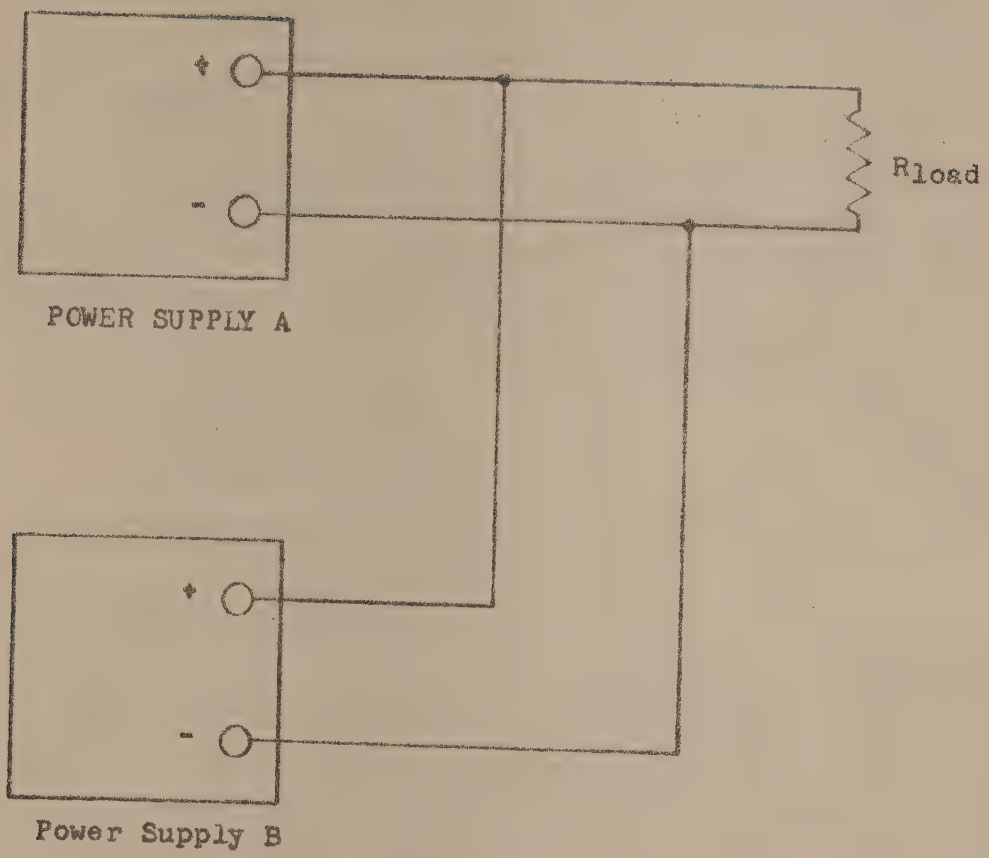


Figure 2-1.

SECTION III - THEORY OF OPERATION

3.1 GENERAL

The purpose of this power supply is to transform and rectify the AC input into a well regulated, stable and adjustable DC output. In performing these functions, the circuitry of the unit may be broken down into four basic sections, which shall be referred to in the following order:

1) Primary Input
2) Reference Supply
3) Series Regulator
4) Comparator and Error Amplifier

3.2 CIRCUIT ANALYSIS

The circuitry has been outlined in simplified form in the Block Diagram (Figure 3-1) located at the rear of this section. As each basic circuit is described, it will be advantageous to refer to the Block Diagram and the Schematic Diagram located at the rear of the Appendice Section of this instruction manual.

3.2.1 Primary Input

Input power is obtained through power transformer T1, full wave rectifier diode sets CR1 and CR2, CR10 and CR11, CR12 and CR13, and filter capacitor C1, C7 and C8. Each rectifier set provides the necessary DC voltages to the various sections of the unit.

When AC power switch S1 is set to AC ON, AC pilot lamp DS1 glows, and AC power is applied to the power transformer. Regulated DC output power is immediately available from the power supply.

3.2.2 Reference Supply

The rectified and filtered voltage from rectifiers CR1 and CR2 and filter capacitor C1 is pre-regulated by Coarse Reference Regulator zener CR3. This provides a stabilized DC voltage to Constant Current Source Q2, whose output is regulated by Precision Voltage Reference zener CR5. Constant Current Source Q1 controls the drive to Q2 and in turn is controlled by Q2. The voltages developed across Constant Current Source References CR4 and CR5 are highly stable reference voltages established at a higher positive potential than the positive output of the supply.

3.2.3 Series Regulator

The DC voltage from diodes CR10 to CR13 is directed through the Series Pass transistors. The conduction of these transistors is controlled by circuitry which causes them to act as variable resistors. Their overall resistance varies in accordance with the need of the power supply to increase or decrease its output voltage or current.

To dissipate power within the Series Pass circuit when power is not being fed into a load, large current handling "throw off" resistors are placed in parallel with the Series Pass transistors. The throw off resistors are placed in a location remote from the Series Pass transistors, to reduce heat concentration and increase transistor life and reliability.

The Series Pass transistors are controlled by several driver stages which amplify signals from the error amplifier.

3.2.5 Comparator and Error Amplifier

The voltage sensing and comparison is accomplished by differential amplifier Q10. A sample of the output voltage on the base of Q10 is compared to the stable reference voltage on the base of comparator Q9. An unbalance caused by a change in voltage at either the negative sensing terminal or across voltage

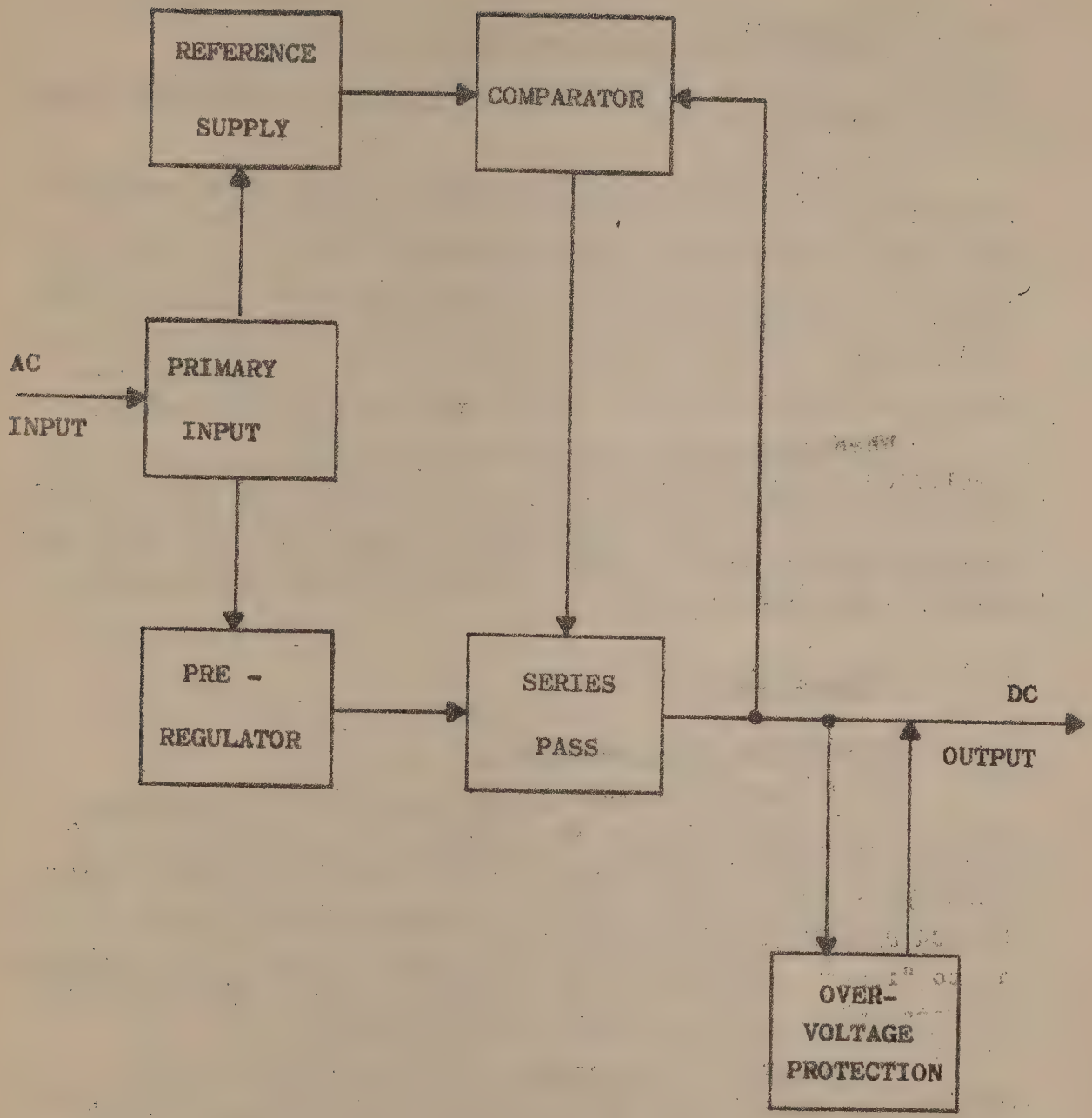


FIGURE 3-1 - BLOCK DIAGRAM

3.2.5 Comparator and Error Amplifier (Cont'd)

adjustment controls R29 and R30 will appear as a voltage change in the collector of Q10.

This difference voltage is amplified by error amplifier Q6, and is used to regulate the Series Pass transistors via the Series Pass drivers. Error amplifier Q6 has two diode inputs to its base which form an OR gate for error signals. CR7 supplies error signals from the comparator, and CR6 supplies an error signal in the event of a short circuit, or if the power supply is driven into the current limiting mode of operation.

When operating in the current limiting mode, differential amplifier Q3 and Q4 become balanced, causing diode CR6 to conduct, and in turn drives error amplifier Q6 toward cut-off. This signal also causes Q7 to conduct, thereby causing current mode indicator lamp DS2 to glow.

3.3 OPTIONAL FEATURES

3.3.1 Overvoltage (OV) Protection

If the output voltage should rise above the programmed output level, a portion of the signal developed across the OV Sensitivity control will cause the OV Sensor to conduct, which in turn drives the OV Reference into conduction. The output of the OV SCR Driver is applied to the gate lead of the OV SCR, causing it to "fire". "Firing" of the OV SCR cuts off the Series Pass drivers and in turn, the Series Pass circuit.

If the overvoltage condition is caused by a short in the Series Pass circuit, the OV SCR will "fire", causing the OV fuse to open.

S E C T I O N IV - M A I N T E N A N C E

- W A R N I N G -

High Voltages Are Present
Use Caution

4.1 GENERAL

This power supply is a precision instrument. It is strongly recommended that only experienced troubleshooting personnel perform troubleshooting operations or attempt to repair the unit. If the power supply appears to be malfunctioning at all, the following procedure is recommended for isolating possible defects.

4.2 LOADS AND INTERCONNECTIONS

1. Disconnect all interconnections and loads to which the unit is normally connected.
2. Place shorting links between rear panel terminals 1 and 2, 4 and 5, and 6 and 7. These connections must be securely made, or deterioration of output regulation will occur.
3. Connect a resistive dummy load across output terminals +V and -V. This load should be of sufficient value to allow the unit to operate at its maximum rated current and voltage output.
4. Apply nominal AC input power to the unit and check for normal operation. Satisfactory operation at this time would indicate that any malfunction previously encountered, is external in nature. All

4.2 LOADS AND INTERCONNECTIONS (Cont'd)

interconnections and loads normally used in conjunction with this power supply should then be carefully checked for electrical defects.

4.3 TROUBLESHOOTING

1. Set VOLTAGE ADJUST and VOLTAGE VERNIER controls fully CW. Using a 20,000 ohms per volt voltmeter or oscilloscope, check the voltages across the various circuit components listed in the TROUBLESHOOTING GUIDE, located immediately before the schematic diagram at the rear of this instruction manual. The sample voltages listed in this guide apply only if the unit is operating at its nominal AC input, and has a dummy load of sufficient size connected across its output to allow operation at maximum rated current and voltage output levels. Any reading which is grossly incorrect indicates that the stage being tested or the one immediately preceding it, is defective. The Block Diagram, Schematic Diagram and appropriate sections of the Theory of Operation will prove helpful in any troubleshooting work. Proper polarity to be observed when testing can be easily obtained from the Schematic Diagram.

2. If voltage checks show no noticeable deviations from the prescribed values, disconnect AC power and proceed with point to point resistance checks across pots, switches, diodes, resistors, transistors in that order.

3. When the trouble is of an intermittent nature such as poor regulation, ripple etc., the use of an oscilloscope to determine dynamic changes will be necessary.

4.3 TROUBLESHOOTING (Cont'd)

The section on Theory of Operation should be consulted to determine circuit performance with varying output conditions.

SECTION V - CALIBRATION

5.1 GENERAL

The following adjustments should be made when necessary to assure optimum operating characteristics and maximum efficiency of the Trygon power supply.

5.2 TEST EQUIPMENT REQUIRED (or equivalent)

(A) Oscilloscope, Tektronix Type 561
(B) Differential Amplifier Plug In, Tektronix Type 63
(C) Time Base Plug In, Tektronix Type 67
(D) Differential VTVM, Fluke Model 825A
(E) AC VTVM, Hewlett Packard Model 400D
(F) VOM, Simpson Model 260
(G) Variable Auto transformer, Powerstat Type 3PN136 (20 Ampere rating)

5.2.1 Shorting Link Application

For test purposes, shorting links should be connected across terminals 1 and 2, 4 and 5 and 6 and 7 to provide local sensing and local voltage programming. To reduce pick up, shielded wire must be used for all connections between test equipment and the power supply being tested. To prevent ground loops, it is important that only one ground connection be made, as shown in Figure 5-1 and Figure 5-2. Tighten all terminal connections as securely as possible, and set all front panel controls fully CW.

5.3 CALIBRATION PROCEDURE

5.3.1 Voltage Adjust Control

5.3.1 Voltage Adjust Control (Cont'd)

A) Maximum Voltage

Set front panel VOLTAGE ADJUST and VOLTAGE VERNIER controls fully CW. Adjust Maximum Voltage control R24 to obtain an output voltage 0.5 VDC in excess of the maximum rated output voltage.

B) Minimum Voltage

Set front panel VOLTAGE ADJUST and VOLTAGE VERNIER controls fully CCW. Adjust Minimum Voltage control R28 to obtain a negative output voltage of 0.1 VDC.

C) Readjustment

Adjustment of either Maximum Voltage control R24 or Minimum Voltage control R28 will have an effect upon the other. Therefore, these controls should be readjusted if necessary, as outlined in preceding paragraphs 5.3.2 (A) and (B), upon initial completion of this adjustment.

NOTE

If partial rotation of the VOLTAGE ADJUST controls produces no apparent change in indicated output voltage, further rotation of these controls should not be attempted. Rotation of these controls fully CCW with little or no output voltage regulation can result in damage to the controls, the load, or both. Set the AC POWER switch to OFF, and proceed with the troubleshooting outlined in Section IV (MAINTENANCE) of this instruction manual.

Set front panel VOLTAGE ADJUST and VOLTAGE VERNIER controls fully CCW and observe that the voltage indicated on the unit and test voltmeters drops slightly below the zero setting of the meters. The output voltage should be approximately negative 200 MV. Reset voltage controls fully CW.

ELECTRONICS INC.

5.3.2 Current Adjust Controls

A) Maximum Current

Connect a test ammeter having a full scale current indicating capacity of 150% that of the rated current output across the output terminals of the power supply. (Set all front panel controls fully CCW). Apply power to the unit under test and slowly rotate CURRENT ADJUST control fully CW. Observe that the maximum current obtainable is approximately 105% that of the maximum rated current output. If it is not possible to achieve 105% of the maximum rated current output, adjust Maximum Current control R41 until that value is attained. Set AC Power Switch to OFF.

Connect a suitable load resistance across the output terminal connections. The load resistance must be able to dissipate the rated power of the unit (P = IE) and must be of sufficient value to yield the rated output current when the rated voltage is applied. Set AC Power Switch to ON. Note the voltage indicated on the Differential VTVM. Disconnect the resistive load from the output and observe the voltage indicated on the Differential VTVM. The maximum change in output voltage should not exceed by more than 0.01% or 3 mv (whichever is greater) that of the output voltage indicated with the load resistance applied across the output terminals.

If it is not possible to maintain the load regulation as stated in the preceding paragraph, readjust Maximum Current control R41 slightly and recheck the load regulation.

5.3.3 Constant Voltage Operation

A) Load Regulation

5.5.3 Constant Voltage Operation (Cont'd)

With the equipment connected as shown in Figure 5-1, connect a suitable load resistance across the Output terminal connections. The load resistance selected must be able to dissipate the rated power of the unit (P = IE) and must be of sufficient value to yield the rated output current when the rated voltage is applied. Note the voltage indicated on the Differential VTVM. Disconnect the resistive load from the output. The maximum change in output DC voltage indicated on the Differential VTVM should not exceed by more than 0.01% or 3 mv (whichever is greater) that of the output voltage indicated with the load resistance applied across the output terminals.

B) Line Regulation

Place the resistive load across the output and note the voltage indicated on the Differential VTVM. Vary the AC input power 10% above and below the nominal AC input level. The maximum change in output voltage should not exceed by more than 0.01% or 2 mv (whichever is greater) that of the output voltage measured at either extreme of the AC input.

C) Ripple Voltage

In order to reduce pickup, shielded test leads should be used in making ripple measurements. With the resistive load connected across the output terminals, measure the AC ripple with the AC VTVM. Vary the AC input power 10% above and below the nominal AC input level. The maximum ripple amplitude should not exceed 0.5 mv RMS.

5.3.4 Constant Current Operation

A) Load Regulation

With the equipment turned off, disconnect the resistive load from the output terminals. Connect a small current sensing resistor in series with the resistive load and then connect the load back across the output terminals. Selection of the proper value for the current sensing resistor may be easily made using the formula $R_S = \frac{I}{I_R}$ where R_S = Value of Current Sensing Resistor and I_R = Rated Load Current. Connect the equipment as shown in Figure 5-2, and apply power to the power supply.

Vary the VOLTAGE ADJUST controls and resistive output load as necessary, to achieve rated current and voltage output. Decrease the load resistance until current meter reading exceeds full scale indication. Rotate CURRENT ADJUST control CCW to return the current meter reading to full scale. Observe that the output voltage has decreased from its previous full scale reading, and that increasing the VOLTAGE ADJUST controls has no effect upon the output voltage or current. This indicates that the unit is now operating in the Constant Current mode.

5.3.5 Overvoltage (OV) Sensitivity (Optional)

The sensitivity of the Overvoltage Protection circuit is determined by the setting of the Overvoltage Sensitivity control. This control is factory preset to cause a short circuit to be applied across the output of the unit if the output voltage attempts to rise more than 5% or 1.5 volts above the programmed voltage.

Although an internal control, the OV Sensitivity control is not "solder locked" in place as are the other internal controls, but may be varied to suit the individual needs of the

5.3.5 Overvoltage (OV) Sensitivity (Optional) (Cont'd)

user. This control may be varied from outside the unit by inserting a screwdriver through one of the ventilation holes in the top of the power supply case.

To determine the proper point at which the OV Sensitivity control should be set to automatically shut the unit off, connect the output of a second power supply having a higher output voltage capability, in parallel with the unit under test. Set the output of the second unit 10% higher than that of the first unit. Adjust the OV Sensitivity control until the unit under test automatically shuts itself off.

5.3.6 Test Set-Up

The equipment should be connected as shown in Figures 5-1 or 5-2 for testing in either the Constant Voltage or Constant Current modes of operation.

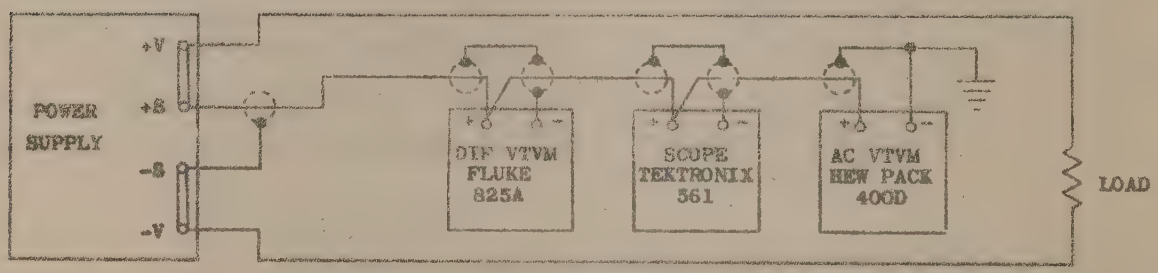


FIGURE 5-1
CONSTANT VOLTAGE OPERATION

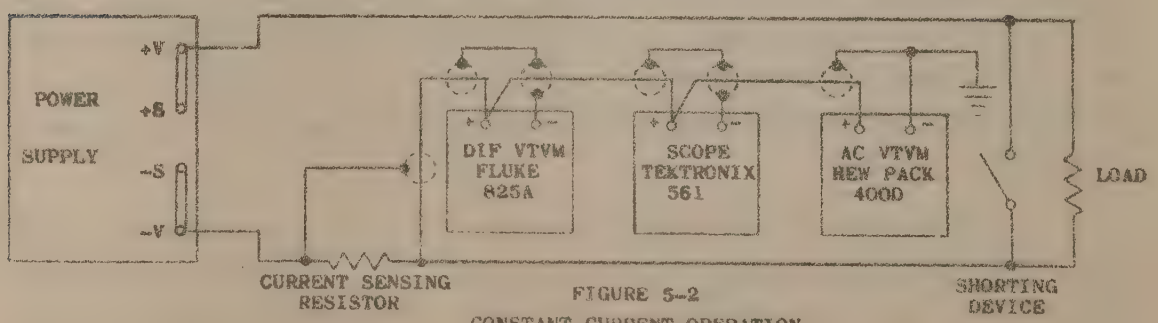


FIGURE 5-2
CONSTANT CURRENT OPERATION

MANUFACTURER'S CODE LISTING - ELECTRICAL PARTS

1) The numbers designated in the SPARES column of the following ELECTRICAL PARTS LISTING indicate the recommended spare parts requirement for support of this equipment for a period of one year.
2) The code designations listed in the MFR column of the ELECTRICAL PARTS LISTING have been assigned to the following manufacturers:

CODE	MANUFACTURER	CODE	MANUFACTURER
A-B	ALLEN BRADLEY	LEE	LEECRAFT
ARN	ARNOLD	MILW	MILWAUKEE
BUSS	BUSS	MOTO	MOTOROLA
CARL	CARLING	PHAO	PHAOSTRON
CD	CORNELL DUBILIER	RCA	RADIO CORPORATION OF AMERICA
CLAR	CLAROSTAT	ROT	ROTRON
CORN	CORNISH	SAGE	SAGE
CTS	CHICAGO TELEPHONE SUPPLY	SANG	SANGAMO
ERIE	ERIE	SPRA	SPRAGUE
GE	GENERAL ELECTRIC	STEV	STEVENS
GI	GENERAL INSTRUMENTS	TRAN	TRANSITRON
HOYT	HOYT	TRY	TRYGON
IREC	INTERNATIONAL RECTIFIER CORP.	UNI	UNITRODE
IRES	INTERNATIONAL RESISTOR CORP.	WILG	WILGREEN
OHM	OHMITE	WL	WARD LEONARD
SCHW	SCHWEBER	SEMC	SEMCOR
HW	HONEYWELL	TRU	TRUOHM

LIST OF ELECTRICAL PARTS - MODEL HH 32-1.5

Designation	Component	MFR	Part Number	Spares	Stock No.
C1	Capacitor, 500 MFD, 75V	GE	43F1109CA8	1	820010
C2,5,12	Capacitor, .01 MFD, 600V	ERIE	811Z5V103P	2	800090
C3	Capacitor, .0033 MFD, 600V	ERIE	CK62AW332M	1	800025
C4	Capacitor, .001 MFD, 600V	ERIE	CK62BX102M	1	800006
C6,10	Capacitor, 10 MFD, 50V	MALL	TTXE	2	810010
C7	Capacitor, 18 MFD, 100V	SPRA	40D186F100DH4	1	810020
C8	Capacitor, 2800 MFD, 75V	GE	W MYLAR 86F	1	820177
C9	Capacitor, 1500 MFD, 50V	SPRA	39D	1	819955
C11	Capacitor, 34 MFD, 15V	MALL	TTXE	1	810057
CR1,2,6,7,8,9, 12-15,17	Diode	GI	1N4384	6	720384
CR18	Diode	TRY	TR4148	1	720440
CR3	Diode, Zener	HOFF	1N1360A	1	720241
CR4,16	Diode, Zener	TRAN	1N751A	2	720181
CR5	Diode, Zener	MOTO	ZO132	1	720263
CR10,11	Diode	IREC	1N1344	1	720230
DS1	Pilot Light	LEE	36N1311-6	1	770024
DS2	Light Indicator	IND. DEV.	2190A87	1	770023

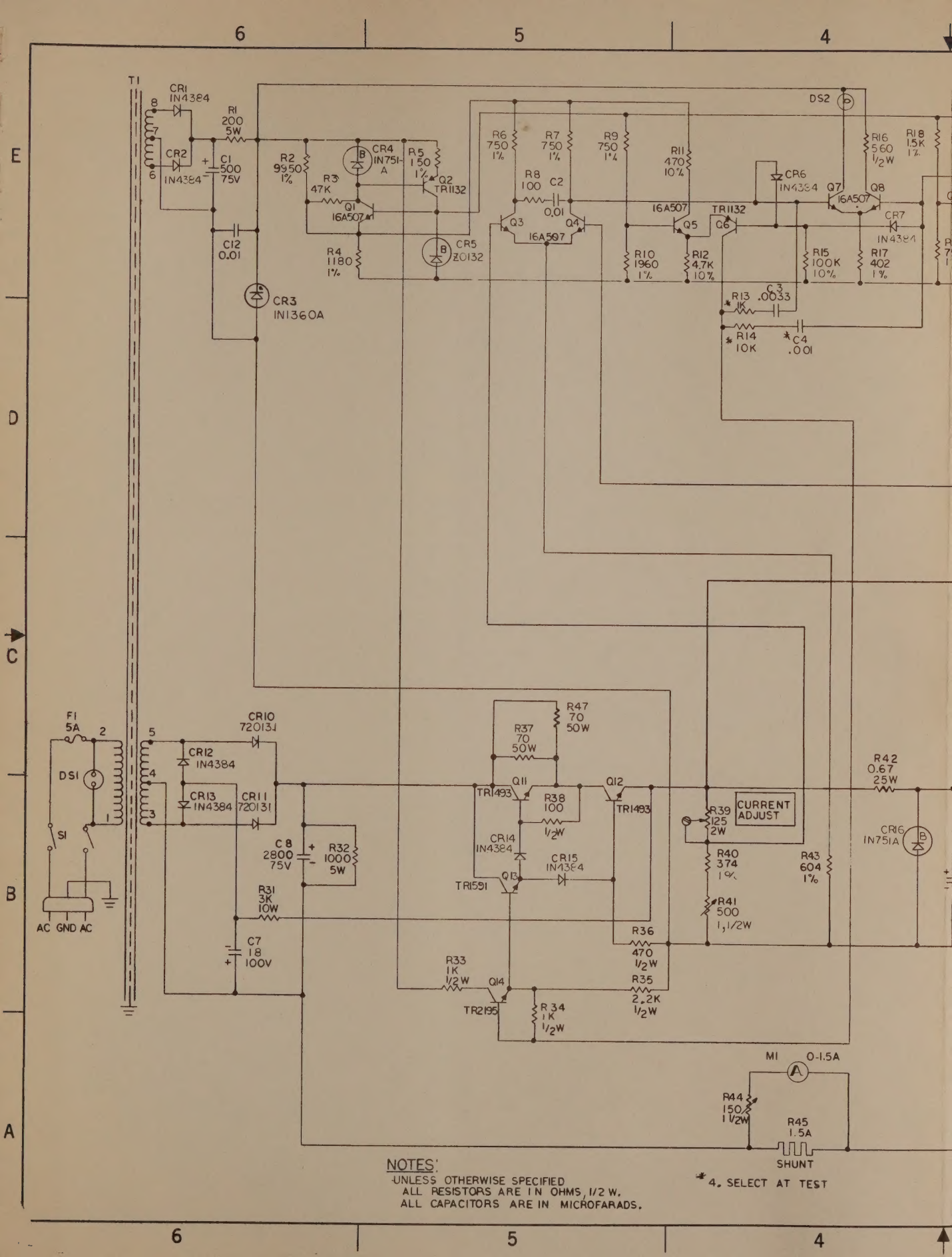
LIST OF ELECTRICAL PARTS - MODEL HH32-1.5					
Designation	Component	MFR	Part Number	Spares	Stock No.
F1	Fuse	BUSS	MDL10	5	870200
M1	Meter, 1.5A	HW	MS1T	1	750300
M2	Meter, 40V	HW	MS1T	1	752620
P1	Cord Line	CORN	18 3		941000
Q1,3,4,5,7,8,9, 10	Transistor	GE	16A507	6	700180
Q2,6	Transistor	TRY	TR1132	2	700000
Q11,12	Transistor	TRY	TR1490	2	700080
Q13	Transistor	TRY	TR1591	1	700197
Q14	Transistor	TRY	TR2195	1	700110
R1	Resistor, 200Ω, 5W, 5%	WL	5XM200	1	640389
R2	Resistor, 9.95KΩ, .5W, 1%	IRES	CECTO	1	620600
R3	Resistor, 47KΩ, .5W, 10%	AB	RC20GF473K	1	610340
R4	Resistor, 1.18KΩ, .5W, 1%	IRES	CECTO	1	620320
R5	Resistor, 150Ω, .5W, 1%	IRES	CECTO	1	620050
R6,7,9,19,23	Resistor, 750Ω, .5W, 1%	IRES	CECTO	5	620250
R8,22,38	Resistor, 100Ω, .5W, 10%	AB	RC20GF101K	2	610070

LIST OF ELECTRICAL PARTS - MODEL HH32-1.5

Designation	Component	MFR	Part Number	Spares	Stock No.
R41	Potentiometer, 500Ω, 1.5W	CTS	110	1	600146
R42	Resistor, .67Ω, 25W	IRES	2D	1	650095
R43	Resistor, 604Ω, .5W, 1%	IRES	CECTO	1	620210
S1	Switch, DPST	CARL	2BK63-73	1	880090
T1	Transformer	TRY	HHT32-1.5	1	509040

LIST OF ELECTRICAL PARTS - OVERVOLTAGE

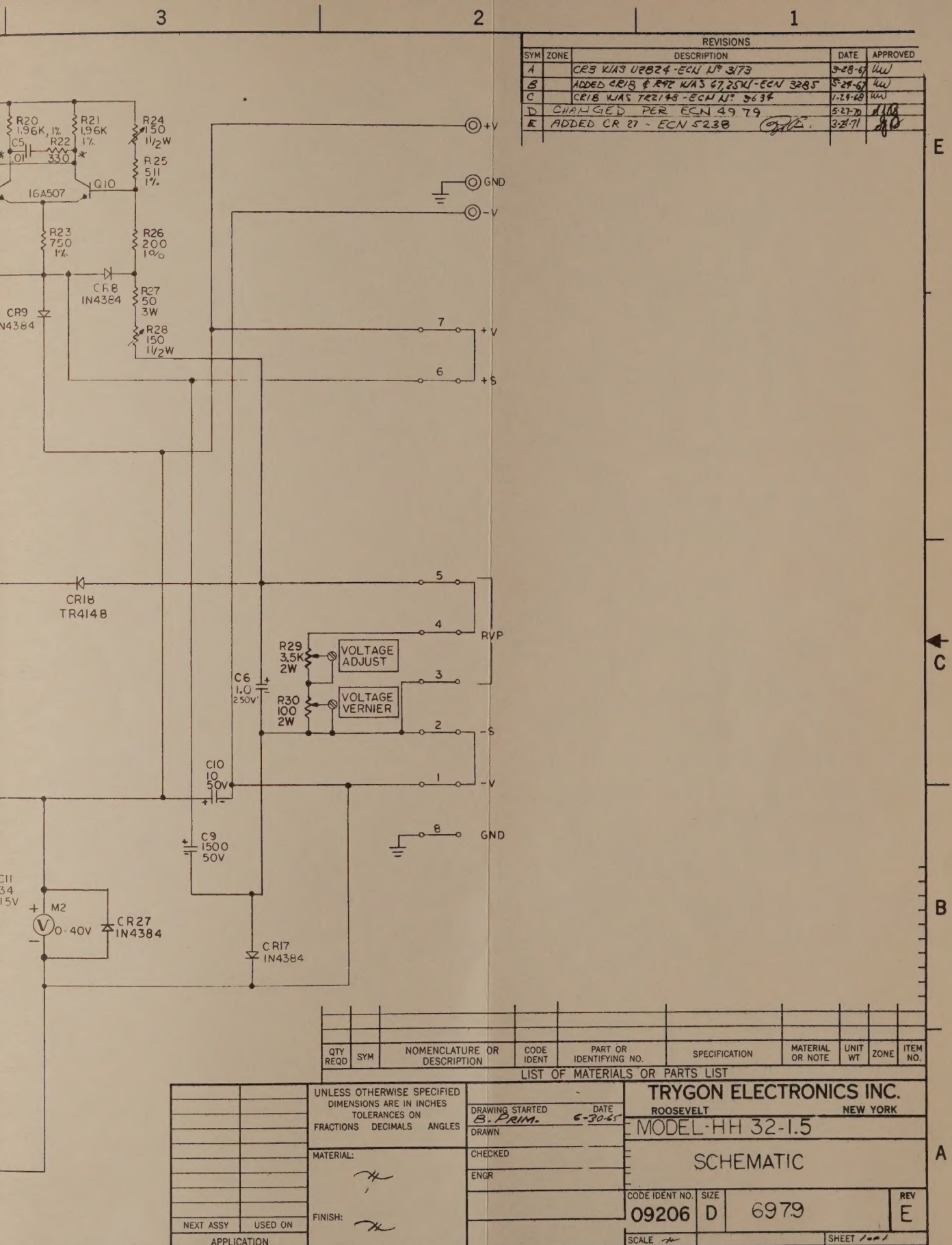
Designation	Component	MFR	Part Number	Spares	Stock No.
C15	Capacitor, .047 MFD, 250V	COMA	MET MYLAR	1	800147
CR20	Diode, Zener	TRAN	IN751A	1	720181
CR24	Diode	IREC	IN1341	1	720200
CR25	Rectifier, Silicon Control	GE	C30F	1	720015
F2	Fuse	BUSS	AGC1.5	5	870040
Q20	Transistor	GE	16A507	1	700180
Q21	Transistor	TRY	TR2905	1	700115
Q23	Transistor	TRY	TR1132	1	700000
R50	Resistor, 1.5KΩ, .5W, 1%	IRES	CECTO	1	620360
R51	Resistor, 470Ω, .5W, 10%	AB	RC20GF471K	1	610140
R52	Resistor, 10KΩ, .5W, 10%	AB	RC20GF103K	1	610290
R53	Resistor, 4.7KΩ, .5W, 10%	AB	RC20GF472K	1	610250
R54	Resistor, 1KΩ, .5W, 10%	AB	RC20GF102K	1	610180
R55	Potentiomeyer, 5KΩ, 1.5W, 20%	CTS	110	1	600290



NOTES:

UNLESS OTHERWISE SPECIFIED
ALL RESISTORS ARE IN OHMS, 1/2 W.
ALL CAPACITORS ARE IN MICROFARADS.

* 4. SELECT AT TEST


3
2
1
REVISIONS
SYM | ZONE | DESCRIPTION | DATE | APPROVED
A | | CR3 WAS U2824-ECN N° 3173 | 3-28-67 | MW
B | | ADDED CR18 & R32 WAS 67,25K-ECN 3285 | 5-29-67 | MW
C | | CR18 WAS TR2148-ECN N° 3634 | 1-29-68 | MW
D | | CHANGED PER ECN 4979 | 5-27-70 | dlb
E | | ADDED CR 27 - ECN 5238 | 3-27-71 | dlb
R20 1.96K, 1%
R21 1.96K 1%
R22 330
C5 .01
R24 150 1½W
R25 511 1%
Q10 16A507
R23 750 1%
R26 200 1%
CR8 IN4384
R27 50 3W
R28 150 1½W
CR9 N4384
+V
GND
-V
7
+V
6
+S
CR18 TR4148
5
4
RVP
R29 3.5K 2W
VOLTAGE ADJUST
C6 1.0 250V
3
R30 100 2W
VOLTAGE VERNIER
2
-S
C10 10 50V
1
-V
8
GND
C9 1500 50V
C11 34 15V
M2 0-40V
CR27 IN4384
CR17 IN4384
E
C
B
A
QTY REQD | SYM | NOMENCLATURE OR DESCRIPTION | CODE IDENT | PART OR IDENTIFYING NO. | SPECIFICATION | MATERIAL OR NOTE | UNIT WT | ZONE | ITEM NO.
LIST OF MATERIALS OR PARTS LIST
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES
DRAWING STARTED B. PRIM. DATE 6-30-65
DRAWN
CHECKED
ENGR
MATERIAL:
FINISH:
NEXT ASSY | USED ON
APPLICATION
TRYGON ELECTRONICS INC.
ROOSEVELT NEW YORK
MODEL-HH 32-1.5
SCHEMATIC
CODE IDENT NO. 09206
SIZE D
6979
REV E
SCALE
SHEET 1 of 1

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